APPENDIX 10F

Chemical Engineering Design Criteria

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10F1 Introduction

Control of the design, engineering, procurement, and construction activities on the Project will be completed in accordance with various predetermined standard practices and project specific programs/practices. An orderly sequence of events for the implementation of the Project is planned consisting of the following major activities:

- Conceptual design
- Licensing and permitting
- Detailed design
- Procurement
- Construction and construction management
- Start-up, testing, and checkout
- Project completion

The purpose of this appendix is to summarize the codes, standards and general engineering design criteria for the systems storing, handling or otherwise using of chemicals on the Project. These criteria form the basis of the design for these components and systems of the Project. More specific design information will be developed during detailed design to support equipment and erection specifications. It is not the intent of this appendix to present the detailed design information for each component and system, but rather to summarize the codes, standards, and general criteria that will be used.

Section 2.0 summarizes the applicable codes and standards and Section 3.0 includes the general design criteria for design water quality, chemical conditioning, chemical storage, and waste water treatment.

10F2 Design Codes and Standards

The design specification of all work will be in accordance with the applicable laws and regulations of the federal government, the State of California, and applicable local codes and ordinances. Codes and standards partially unique to chemical engineering design to be used in design and construction are summarized below.

- ASTM - American Society for Testing and Materials
  - ASTM D1888 - Referee Method B for TDS
  - ASTM D859 - Referee Method B for Silica as $Si0_2$
  - ASTM D888 - Referee Method A for Dissolved Oxygen
  - ASTM D313 - Referee Method D for C02.
- OSHA - Occupational Safety and Health Administration

Other recognized standards will be used as required to serve as design, fabrication, and construction guidelines when not in conflict with the above listed standards.

10F3 General Design Criteria

10F3.1 Water Source and Treatment System

An adequate supply source of potable water will be available to support year round plant at full load operation. Source water quality and temperature will be within each application's specified requirements.

For fire protection, the dedicated fire water tank is sized to meet NFPA requirements of two hours of storage capacity for the worst case demand. The tank will be constructed of mild steel. Chlorine or other suitable biocide will be introduced into the tank on a periodic basis to control biological growth. A recirculation system for the tank will be provided to ensure adequate mixing of the chlorine or other suitable biocide. The fire water tank will meet NFPA and local jurisdictional requirements.

Adequate chemical storage will be provided for 30 days of operation for water treatment chemicals.

10F3.2 Wastewater Treatment and Discharge

The wastewater treatment and discharge will be designed to process and treat all waste streams in accordance with approved discharge permit requirements. Equipment drains and floor drains from the chemical feed and water treatment areas will be collected in chemical waste sumps, which will be provided with sump pumps. A pH monitor will be provided in the sumps to monitor the sump water and alarm in the case of a chemical spill.

Wastewater containing hydrocarbons will be collected separately and treated in an API oil/water separator system that is provided by Contractor and discharges into the chemical waste sump. Areas of potentially significant oil spillage will be contained within a curbed area (Also refer to the Civil section).

The Contractor will dispose of all wastes from initial chemical cleaning of equipment and piping. Disposal of these wastes will be in accordance with applicable environmental regulations.

Segregated collection systems will be provided for oily and chemical wastewater.

Neutralization and detoxification will be provided for all chemicals containing wastewater streams (e.g., chemical storage, acid cleaning, turbo compressor washing, other wash water, etc.) Contractor will identify systems where wastewater produced will be stored temporarily on site and removed by truck periodically. For these wastes, a minimum of 30 days storage of liquid waste at full plant load will be installed on site by Contractor.

In addition, 100 percent redundancy will be provided for all critical chemical treatment and wastewater processing pumps, motors and compressors.

Adequate chemical storage for 30 days of operation will be provided.

10F3.3 Chemical Injection Skids, Chemical Storage, and Bottled Gas Storage

The location of the chemical injection skids, distance to injection points, and line sizing will be considered to ensure appropriate addition of chemicals avoiding long transport times and gassing issues.

Appropriate location in buildings or sunshades will be provided based on the chemical requirements for the chemical storage areas, chemical skids, and transport injection lines.

Bottled gas storage areas will be provided with sunshade covers.

Sunshade covers will consider seasonal changes in solar exposure and daily exposure from sun movement.